

## THAT WHICH IS CLAIMED IS:

1. A multi-dose blister package having a plurality of blisters thereon and adapted for use in an inhaler, comprising:

5 a frame member having opposing top and bottom surfaces with a plurality of spaced apart gap spaces, a respective gap space configured to define at least a portion of a sidewall of a respective blister; and

a floor comprising a flexible material attached to the bottom surface of the frame member so that the floor extends under each gap space to define a bottom of each blister.

10

2. A multi-dose blister package according to Claim 1, wherein the frame gap spaces are through apertures, the package further comprising a ceiling attached to the top surface of the frame member so that the ceiling extends above each gap space to define a top of each blister.

15

3. A multi-dose blister package according to Claim 2, wherein the ceiling comprises a flexible material having sufficient structural rigidity to be able to define a plurality of spaced apart projections therein, and wherein the ceiling comprises a plurality of spaced apart projections therein configured to be aligned with the frame member through apertures so that a respective projection overlies a corresponding frame member aperture and defines the top of a respective sealed blister.

20

4. A multi-dose blister package according to Claim 1, further comprising a bolus quantity of dry powder disposed in respective blisters, wherein the frame member is substantially rigid.

25

5. A multi-dose blister package according to Claim 2, wherein at least one of the ceiling and/or floor comprises first and second flexible layers of different materials, a selected one of the layers comprising a flexible piezoelectric material, and wherein, in operation, the piezoelectric material underlying a target blister is configured to repeatedly flex generally upward and downward upon receipt of an electrical input.

30

6. A multi-dose blister package according to Claim 5, wherein the floor second layer comprises the piezoelectric material and is attached to a bottom of the floor first layer, the floor second layer further comprising a predetermined conductive pattern  
5 disposed over a first primary surface and a conductive material disposed over at least a portion of an opposing second primary surface.

7. A multi-dose blister package according to Claim 6, wherein the conductive material on the second primary surface of the second layer comprises a metallized  
10 coating disposed to cover substantially all of the second primary surface.

8. A multi-dose blister package according to Claim 6, wherein the predetermined conductive pattern on the second layer comprises a plurality of spaced apart conductive regions, each region sized and configured to substantially cover a  
15 surface area of a bottom portion of a respective blister underlying each gap space.

9. A multi-dose blister package according to Claim 8, wherein the predetermined conductive pattern further comprises at least one signal trace extending away from each region.  
20

10. A multi-dose blister package according to Claim 8, wherein the signal trace for each blister travels toward a contact zone on the first primary surface of the second layer to allow selective electrical excitation of at least one target blister in operation.  
25

11. A multi-dose blister package according to Claim 10, wherein the ceiling, frame member, and first layer of the floor have a circular shape when viewed from the top with respective substantially aligned center apertures that define a window to expose a portion of an upper surface of the second layer.  
30

12. A multi-dose blister package according to Claim 10, further comprising a rotatable gear having circumferentially spaced apart gear teeth, the gear being

proximate the window of the aligned center apertures and attached to the frame member so that the blister package rotates with the gear.

13. A multi-dose blister package according to Claim 1, wherein neighboring  
5 pairs of blisters comprise a different dry powder held therein.

14. A multi-dose blister package according to Claim 1, wherein neighboring  
pairs of blisters are positioned closer to each other than non-neighboring blisters, and  
wherein each blister of a pair of neighboring blisters includes a different dry powder  
10 held therein.

15. A multi-dose blister package according to Claim 13, wherein the  
neighboring blisters are sized and configured to, in operation and in position in an  
inhaler, release their dry powders substantially concurrently to a user upon inhalation.  
15

16. A multi-dose blister package according to Claim 2, wherein the frame  
member has a thickness that is greater than the thickness of the floor and ceiling  
combined.

20 17. A multi-dose blister package according to Claim 1, wherein the frame  
member is a laminated structure having increased structural rigidity relative to the  
floor and/or ceiling.

18. A multi-dose blister package according to Claim 1, wherein the frame  
25 member is a unitary polymer structure having increased structural rigidity relative to  
the floor.

19. A multi-dose blister package according to Claim 1, wherein the frame  
member has a primary upper surface that defines a ceiling above the gap spaces.  
30

20. A multi-dose blister package according to Claim 1, further comprising a  
generally planar sealant layer disposed over the frame member to define a ceiling.

21. A multi-dose blister package according to Claim 20, wherein the ceiling comprises a piezoelectric polymer.

5        22. A multi-dose blister package according to Claim 2, wherein the ceiling is moisture resistant and comprises foil and a polymer.

23. A multi-dose blister package according to Claim 7, wherein the second layer of the floor comprises a piezoelectric polymer.

10

24. A multi-dose blister package according to Claim 1, wherein opposing sidewalls of a respective gap space are inclined so that the sidewalls taper farther away from each other from a bottom to top portion thereof.

15        25. A multi-dose blister package according to Claim 24, wherein the sidewalls have substantially constant angles of inclination of between about 20-40 degrees from a bottom to a top portion thereof.

20        26. A multi-dose blister package according to Claim 7, further comprising:  
a power source;  
an input signal generating circuit that is in communication with the power source and is configured to provide electrical input to selectively flex the floor of a target blister; and  
computer readable program code that is in communication with the signal  
25        generating circuit and is configured to define at least one predetermined non-linear vibration input signal selected to represent *a priori* flow characteristic frequencies of the dry powder held in the blisters.

27. A multi-dose blister package according to Claim 1, wherein the frame  
30        member comprises a molded polymer body with sidewalls that are about 2 mm deep.

28. A multi-dose blister package according to Claim 1, wherein the frame member apertures are substantially circular when viewed from the top and/or bottom.

5 29. A multi-dose blister package according to Claim 7, wherein the second layer comprises a flexible piezoelectric material that has a surface area that is about the same as that of the first floor layer.

30. A multi-dose blister package according to Claim 7, wherein the second layer comprises a flexible piezoelectric material that has a surface area that is less  
10 than that of the first floor layer.

31. A multi-dose blister package according to Claim 30, wherein the second layer has a shape that generally corresponds to the shape of the predetermined conductive pattern.  
15

32. A method for fabricating a multi-dose blister package having a plurality of blisters thereon and adapted for use in an inhaler, comprising:

providing a generally rigid frame member having opposing top and bottom surfaces with a plurality of spaced apart gap spaces, a respective gap space configured  
20 to define at least a portion of a sidewall of a respective blister;

placing a metered quantity of dry powder in each of the blisters; and  
sealing a floor comprising a flexible material to the bottom surface of the frame member so that the floor extends under each gap space to define a bottom of each blister.  
25

33. A method according to Claim 32, wherein the gap spaces are through apertures, the method further comprising attaching a ceiling to the top surface of the frame member so that, in operation, the ceiling extends above each gap space to define a top of each blister.  
30

34. A method according to Claim 33, further comprising forming projections in the ceiling so that the projections define wells prior to the attaching step.

5 35. A method according to Claim 34, wherein the placing the dry powder is carried out after the wells are formed in the ceiling.

36. A method according to Claim 33, wherein the placing the dry powder is carried out before the sealing step.

10 37. A method according to Claim 35, wherein the placing the dry powder is carried out before the sealing and after the attaching.

38. A method according to Claim 33, wherein the floor and/or ceiling comprises a flexible piezoelectric material.

15

39. A method according to Claim 33, wherein the floor comprises first and second flexible layers, the first layer comprising foil and the second layer comprising a flexible piezoelectric material.

20 40. A method according to Claim 39, wherein the piezoelectric material comprises a piezoelectric polymer.

41. A method according to Claim 39, further comprising attaching the floor first and second flexible layers together so that, in operation, the piezoelectric material causes the first layer to repeatedly flex generally upward and downward in concert therewith.

25

42. A method according to Claim 39, wherein the floor first layer defines a contact surface for the dry powder held in a respective blister with the floor second layer being attached to a bottom of the floor first layer.

30



43. A method according to Claim 42, further comprising forming a predetermined conductive pattern over a first primary surface of the second floor layer and a conductive material over at least a portion of an opposing second primary surface of the second floor layer.

5

44. A method according to Claim 32, wherein the frame member apertures are configured with inclined surfaces so that a bottom portion of a respective aperture has a lesser cross-sectional area than a top portion thereof.

10

45. A method according to Claim 43, wherein the forming step comprises printing conductive ink onto the first primary surface to define the conductive pattern.

15

46. A method according to Claim 45, further comprising orienting the predetermined conductive pattern to face toward the first layer during the attaching step.

20

47. A method according to Claim 33, wherein the ceiling has a sheet configuration during the attaching step, the method further comprising forming the ceiling sheet configuration into a desired shape after the attaching step.

25

48. A method according to Claim 46, wherein the attaching step comprises heat and/or pressure bonding the second layer to the first layer.

49. A method according to Claim 43, wherein the attaching step comprises applying adhesive to at least one of a bottom surface of the first layer and/or a top surface of the second layer.

30

50. A method according to Claim 43, further comprising testing the second floor layer and/or blister package for electrical integrity of the piezoelectric material and/or predetermined conductive pattern.

51. A method according to Claim 32, further comprising attaching an inhaler-mounting member to the frame member.

52. A method according to Claim 32, further comprising forming the frame member with neighboring apertures that are positioned closer together than non-neighboring apertures, and wherein the placing step comprises placing different dry powder in each blister of a pair of blisters comprising each aperture of neighboring aperture pair to thereby provide blisters that can hold dry powder that, in operation, can be dispensed substantially concurrently in combination.

10

53. A method according to Claim 43, wherein the forming the predetermined conductive pattern on the second layer comprises forming a plurality of spaced apart conductive regions, each region sized and configured to be substantially coextensive with a bottom portion of a respective blister.

15

54. A method according to Claim 53, wherein the forming the predetermined conductive pattern comprises forming at least one signal trace extending away from each region.

20

55. A method according to Claim 54, wherein the forming the signal trace comprises configuring the signal traces to travel toward respective conductive contact zones on the first primary surface of the second layer.

25

56. A method according to Claim 38, wherein the ceiling, frame member, and first layer of the floor have a circular shape with respective center apertures, the method further comprising substantially aligning the center apertures to expose a portion of an upper surface of the second layer.

30

57. A method according to Claim 32, further comprising forming the ceiling, frame member and floor so that selected neighboring pairs of sealed blisters are closer together than other blisters and placing a different dry powder in each of the pairs of neighboring blisters.



58. A method according to Claim 55, wherein the signal trace for each blister is formed to extend toward a different contact zone.

5 59. A method according to Claim 55, wherein selected pairs of blisters have traces that travel toward a common contact zone that is spatially separate from the other contact zones for the other blisters.

60. A method according to Claim 32, wherein the frame member has sidewalls  
10 with inclined surfaces having angles of inclination of between about 20-40 degrees.

61. A method according to Claim 32, wherein the sidewalls of the frame member gap spaces are about 2 mm long.

15 62. A multi-dose dry powder package comprising:  
a polymeric frame body comprising a plurality of spaced apart drug apertures;  
a metered quantity of dry powder medicament held in each of the drug apertures; and  
a detachable floor attached to the frame body apertures.

20 63. A multi-dose dry powder package according to Claim 62, wherein the polymeric frame body has an upper primary surface that defines a generally rigid ceiling over the plurality of spaced apart drug apertures.

25 64. A multi-dose dry powder package according to Claim 62, wherein the spaced apart apertures are through apertures, the package further comprising a sealant layer disposed over the frame body to define a ceiling over each of the apertures.

30 65. A multi-dose dry powder package according to Claim 62, wherein the spaced apart apertures comprise two generally concentric rows of circumferentially spaced apart apertures.